AN ATTEMPT TO FOSTER CREATIVE THINKING IN TEACHERS

By

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CHAPTER I

INTRODUCTION

Literature related to creativity and creative thinking has been in vogue during the past decade. A review of the literature reveals that prior to 1958 there had been thirty major research studies in the field of education which were concerned with creative ability. In 1965 there were more than thirty books devoted entirely to the subject. Calvin Taylor's (1964) recent book lists a bibliography in excess of seven hundred works related to creativity.

The increased concern about the development of the creative potential of our citizens is heartening. Today the need for creative thinking is greater than it has ever been in the history of the American people. The ability to think creatively is imperative if man is to be capable of arriving at solutions to the unforeseeable problems of the future. He will be increasingly called upon to face conditions for which no precedent exists. The explosion of knowledge and the advances of scientific technology which affect our everyday lives make the past inadequate for planning the future.

Programs designed to foster creative thinking have been utilized almost solely by industry and the armed forces. A notable exception is the program designed by Alex Osborn and utilized by the Creative Education Foundation at the State University of New York at Buffalo. Research studies involving this program date back to 1955. Prior to that

date there is no record of research concerning programs for the deliberate development of the ability to think creatively.

The program at Buffalo utilizes an instructional technique known as "brainstorming," which involves group thinking on a problem. A small group of similar individuals comes together to think up new ideas toward the solution of a problem. Deferred judgment is the crux of this technique; all judgments and criticisms are strictly prohibited during the brainstorming session. The leader of the group states the problem specifically, and he clarifies and maintains the rules throughout the session. Participants are encouraged to feel free to suggest any idea, no matter how ridiculous it may sound. Evaluation of the ideas comes at a later session. Brainstorming can be used on either an individual or a group basis.

Guilford's (1962) theories and factor analytic studies of the nature of the intellect were among those which provided the basis for research at Buffalo. He identified three ways of grouping the factors of intellect: operations (cognition, memory, divergent thinking, convergent thinking, and evaluation); contents, or the type of material involved (figural, symbolic, semantic, and behavioral); and products, the results of the application of an operation to a type of content (units, classes, relations, systems, transformations, and implications). Each of the operations can be combined with each classification of contents to derive one of the classifications of products. Guilford's well-known theoretical model of the intellect illustrates his theory. In 1955 only thirty-seven out of 120 cells had been

recognized; by 1966 eighty had been demonstrated. A reproduction of the model appears in Figure 1.

The divergent-thinking category according to Guilford, is that which is most closely related to creativity. When one thinks divergently, he thinks in different directions, sometimes searching, sometimes seeking variety. Of the twenty-four potential abilities involved in divergent thinking, sixteen have been investigated and demonstrated in both adult and ninth-grade populations. At present, investigations are being conducted with six additional hypothesized divergent-production abilities (Guilford, 1966).

As the result of extensive research over the past several years, Guilford has investigated four separate abilities which constitute divergent thinking: sensitivity to problems, fluency of thinking, flexibility of thinking, and originality. He has subdivided each area and has devised tests for utilization in assessing each ability.

Several theorists and researchers (Kelley and Rasey, 1952; Murray, 1959; Getzels and Jackson, 1962; Guilford, 1962; Osborn, 1963; and Torrance, 1962) have emphasized a belief that divergent-thinking ability exists in every healthy human being. They also agree that this ability varies in degree and kind from one individual to another. Guilford has stated, ". . . abilities to think divergently to produce results differ according to the kind of information with which the person deals. An all-round creative person is probably the exception rather than the rule" (Guilford, 1962, 162).

Consensus does not exist among researchers regarding the effect of age on divergent-thinking ability. Lehman (1953) and Torrance

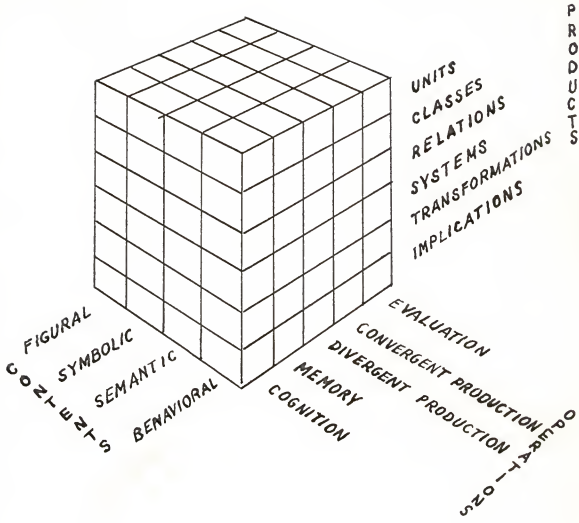

FIGURE 1

THEORETICAL MODEL FOR THE COMPLETE "STRUCTURE OF THE INTELLECT"

(Reproduced by Permission of J. P. Guilford)

(1962) advocate the theory that the ability declines with age. They concur in the belief that the decline is a result of factors accompanying age, such as: decline in physical vigor as well as in sensory and motor precision and a preoccupation with the practical demands of life.

Thurstone argues, ". . . as far as the intellectual factors are concerned, it seems likely that the older men can do inventive work as well as the younger men if they retain the attitudes of curiosity . . ." (Thurstone, 1962, 61). Osborn (1963) agrees that our creative ability can continue to grow year after year in pace with the amount of effort we put into it.

Parnes (1962) and Guilford (1962) assert that the ability to think divergently can be increased both quantitatively and qualitatively by instruction and experience in this type of activity. Guilford states, ". . . in an effort to improve the status of a student in a particular intellectual factor, we [would] give him special exercises in tasks like the tests that are found to measure that factor . . ." (Guilford, 1962, 168). The two investigators differ, however, in suggestions for curriculum application. Guilford advocates the inclusion of these activities in each course from the early school years through higher education. Parnes supports a separate course in divergent thinking. Both men agree that the brainstorming technique of deferred judgment is superior to various other methods of instruction for fostering creative thinking, regardless of the level of educational endeavor (Guilford, 1962; Parnes, 1962).

Statement of Problem

It is generally recognized that the future is uncertain and unforeseeable. Educating today's youth for productive citizenship in an era of rapid change and innovation is difficult if not impossible. A major goal of today's educational endeavor should be the fostering of the development of open and inquiring minds, capable of shifting readily into a "divergent gear," so to speak, when the need arises.

The individuals who could be actively involved in fostering creative, or divergent, thinking in students are teachers. They are the "significant others" with whom students spend a major portion of their waking hours. Lunaas (1963) emphasizes the importance of teachers learning about the research in creativity and discovering ways to use the research findings in their work. More important than knowledge of creativity research, she states, is the provision of opportunities to seek and practice the various skills and abilities involved. This implies that teachers should know something about the field, use techniques designed to stimulate creative thinking, devise assignments allowing for this type of thinking, and provide opportunities for students to exercise these skills.

There is a great emphasis at present on creative thinking. Psychologists have identified intellectual factors involved and have devised tests to measure these factors. Courses have been designed and utilized specifically for the purpose of fostering creative thinking in adults, and it is generally recognized that the adults who have the greatest opportunities for fostering creative thinking in students

are their teachers. What is generally lacking, however, is an effort to foster creative-thinking ability in teachers, through either pre- or in-service teacher education.

The problem investigated in this study was: can creative-thinking ability of teachers be improved through brainstorming and deferred-judgment techniques?

CHAPTER II

REVIEW OF THE RELATED LITERATURE

Kincaid (1965) calls attention to the confusion in current discussions of creativity. He reports that many writers view creativity as either a process or the product resulting from creative activity. The importance of avoiding a dualistic concept of creativity and of viewing the elements of creativity as overlapping, interacting components which all contribute to the whole of creativity is emphasized by Kincaid. Creativity, he states, should be viewed as a continuous whole, including both the act of creating and the products of that act -- thus eliminating dualistic thinking concerning process versus product.

Kincaid's view of creativity embraces this study. Consequently, this review of the literature and the study itself are focused upon a holistic approach.

Need for Creativity

Zirbes (1959) states that creativity will be imperative in the future if the world is to seek and arrive at solutions to problems which none of us today can foresee. We will live in a world of such rapid change that the events of the past will be impractical as guides for finding solutions to future problems. If the challenge of the future is to be encountered and mastered, the inhabitants of that future

world must possess the ability to deviate from the traditions of the past and seek novel solutions to unprecedented conditions.

Our present society and its educational institutions place a premium on convergent thinking, or the ability to arrive at a predetermined "best," or conventional, answer. This ability is rewarded with scholarships, matriculation in colleges and universities, and social and economic prestige. The divergent thinker, who, ironically, provides society with its innovations in all areas of human endeavor, is seldom recognized and rewarded during his productive years. In many instances he is considered less intelligent than the convergent thinker, and educators, given the opportunity, would state a preference to have him enrolled in someone else's classes rather than their own (Getzels and Jackson, 1962; Osborn, 1963; Torrance, 1962). It should not be concluded that convergent thinking has no place in modern education. Indeed, there are many aspects of the school program which should and do emphasize this type of thinking. The plea is for recognition and valuing the potential for divergent thinking that theorists believe all human beings possess.

Measurement of Creative Thinking

Attempts to assess divergent thinking have employed a broad spectrum of "creativity tests." The most widely used are those designed by Guilford (1962) as a result of his factor-analytic technique of assessing intellectual abilities. The present battery of tests is designed to measure the following abilities: sensitivity to problems

(identification of ways of improving products or of flaws in proposed plans), fluency of thinking (rapid listing of words or ideas in a specified category), flexibility of thinking (production of ideas in several categories), and originality (production of novel ideas). Many of the tests from the Guilford battery are experimental in nature and are not published commercially. Data pertaining to reliability and validity of the unpublished tests are difficult to obtain. This information is available, however, on the following tests: Seeing Deficiencies, an instrument designed to assess the ability "sensitivity to problems," was standardized in studies involving aviation cadets and has a reported reliability ranging from .49 to .58 and a validity of .58; Alternate Uses, which assesses the ability "spontaneous flexibility," has a reported reliability ranging from .62 to .85 and a reported validity of .52 for populations of children in grades six and nine and college freshmen; Consequences, which assesses two abilities, "ideational fluency" and "originality," has a reported reliability ranging from .67 to .86 and validity ranging from .42 to .62; and a battery of four fluency tests (ideational, word, associational, and expressional), which has reported reliability ranging from .63 to .76 based on a sample of several hundred naval air cadets and naval officer candidates. Validity measures on the battery of fluency tests are unavailable (Guilford, 1962; Christensen, Merrifield, and Guilford, 1960; Wilson, Christensen, Merrifield, and Guilford, 1960; Kropp and Stoker, 1966). Zaccaria (1956) computed correlations between the Guilford subtests and a "creative activities"

instrument that was administered to aviation cadets and found significantly high correlations for eleven of the fifteen Guilford instruments. Highest correlations involved the instruments designed to measure sensitivity to problems, ideational fluency, and originality.

The Minnesota Tests of Creative Thinking (Torrance, 1962) were developed by the Bureau of Educational Research of the University of Minnesota and were originally adaptations of the Guilford-type tasks: Unusual Uses, Impossibilities, Consequences, Problem Situations, Improvements, and Problems. Adaptation was accomplished by substituting situations or objects which were more familiar to children than those included in the Guilford tests. The Minnesota Tests of Creative Thinking are the result of an attempt to construct tasks that would be models of the creative process, each requiring several types of thinking, whereas the Guilford tests are each designed to measure one specific type of thinking. The tasks included in the Minnesota Tests of Creative Thinking may be classified into three major categories: non-verbal tasks, verbal tasks using non-verbal stimuli, and verbal tasks using verbal stimuli. Non-verbal tasks are: Incomplete Figures (requiring completion of the figures), Picture-Construction (thinking of a picture in which the given shape is an integral part), Circles and Squares (sketching of objects which have circles or squares as the main element in their design), and Creative Design (constructing pictures or designs by making use of colored circles and strips of various sizes and colors). The verbal tasks using non-verbal stimuli include: The Ask-and-Guess Test (asking questions about several pictures and

guessing causes of each situation depicted), Product Improvement (suggesting improvements for several common toys), and Unusual Uses (listing uses for a toy dog and a toy monkey other than as playthings). Verbal tasks using verbal stimuli are: Unusual Uses (suggesting alternate uses for tin cans and books), Impossibilities (listing several impossibilities concerning the control of behavior), Consequences (listing results of improbable situations), Just Suppose (written prediction of possible outcomes of an improbable situation by the introduction of a new or unknown variable), Situations (telling what needs to be done to alleviate problems), Common Problems (listing problems that could arise in a given situation), Improvements (listing defects of common objects), Mother Hubbard (suggesting solutions to the nursery rhyme character's predicament of a bare cupboard), Cow Jumping Problem (suggesting consequences of the cow's jumping over the moon), and Imaginative Stories (writing stories based on suggested topics). Reports of reliability for the Minnesota Tests of Creative Thinking range from .85 to .92 for populations of children. Torrance (1965) reports validity measures for the total battery ranging from .56 to .80.

The Test of Imagination is an adaptation of the Product Improvement, Unusual Uses, and Circles and Squares tasks from the battery of the Minnesota Tests of Creative Thinking. This test, designed specifically for preschool and elementary children, includes Dog Improvement (suggestions for improving a toy dog), Dog Uses (alternate uses for a toy dog), and Circles (sketching objects with a circle as the main element). Yamamoto (1965) reports test-retest reliability of the

Test of Imagination as ranging from .49 to .66 for the various subtests and .79 for the total score. Reported validity of the total test ranges from .19 to .59.

The AC Test of Creative Ability has been used as a device for measuring divergent thinking. This instrument was developed by the AC Spark Plug Division of General Motors Corporation for use in situations involving research, design, and development work. It is a paper-and-pencil test designed to assess quality and quantity of the ideas an individual can produce in a given situation and consists of five parts: (1) listing possible consequences to described problem situations, (2) giving reasons for a statement assumed to be true, (3) describing desirable improvements in common appliances, (4) giving solutions to specified problem situations, and (5) listing possible uses for specified objects. Two scores are derived from responses: a Q (quantity) score, which represents the total number of relevant responses, and a U (uniqueness) score, which is based on weights assigned inversely to the frequency within which a response occurs. The test manual provides no guidelines pertaining to judgment of either relevance of responses or categorization of unique responses. Reports of reliability of the instrument range from .74 to .92 for the total score. An alternate-form reliability of .75 is reported for 39 cases. Reported validity is .75 and is based on small samples of from 35 to 56 subjects. All data concerning validity are derived from four studies conducted by AC Spark Plug Division and one investigation at the Massachusetts Institute of Technology. Test norms are based

on 333 engineering and supervisory personnel (Merrifield, 1965). Parnes and Meadow (1959) utilized this instrument and the originality factor from the Thematic Apperception Test (TAT), a projective measure requiring subjects to create a story related to pictures, and reported a correlation coefficient of .52 in a comparison of the two measures.

The Baron-Welsh Art Scale is incorporated into the Welsh Figure Preference Test. This completely nonverbal test, reportedly usable for any age level, yields a score of aesthetic judgment and is designed to discriminate between artists and nonartists. It consists of 400 cards on each side of which is a drawing or design. The subject is instructed to respond by saying either "Like" or "Don't like." Reported reliability measures on this instrument are inconsistent and range from .51 to .88 for the total scale and from .51 to .92 for the partial scale. Standardization procedures involved a relatively small population composed of 100 male patients in a neuropsychiatric section of a veteran's hospital, 150 normal adults, and 82 children, ages six through eight. No reports of validity are available (Anderson, 1960).

Instruction Toward Creative Thinking

The oldest and most extensive industrial training program designed to foster creative thinking is that utilized by the General Electric Creative Engineering Program. The course is designed to increase technical knowledge, to produce ideas, and to convert these ideas into usable products. Course participants are rigorously screened, and only those indicating the greatest potential are

enrolled; course graduates demonstrate their increased creative ability by standards such as comparisons on pre- and post-tests of various creativity measures, numbers of patents issued them, and ratings by instructors (Von Fange, 1959).

Brainstorming has been the major instructional technique employed in separate courses designed to foster creative thinking. Students who participated in brainstorming sessions have demonstrated creative-thinking ability superior to that of non-participating students as measured by the Guilford tests, the Minnesota Tests of Creative Thinking, and the originality factor derived from the Thematic Apperception Test (Parnes, 1962). No differences were found between performance of older students (aged 23-51) and younger students (aged 17-22) who participated in brainstorming. Evidence has been obtained which supports the theory that once creative thinking has been developed by education, it remains in its improved state (Parnes, 1962; Arici, 1964; Sommers, 1961; Yee, 1964). Group brainstorming was found to produce a greater number of solutions to unstructured problems than did individual brainstorming (Taylor, Berry, and Block, 1957).

Some university courses have been modified to include brainstorming techniques and assignments. Research results indicate that an increase in the ability to think creatively may be accompanied by an increase in knowledge of subject matter (Sommers, 1961; Osborn, 1963).

College-bound high school seniors who utilized programed instructional materials pertaining to brainstorming in addition to instruction in this technique by a teacher demonstrated greater gains on Guilford's creativity measures than students whose instruction was solely that by the programed materials or by the teacher (Parnes, 1966).

Identification with a creativity symbol (a character from a children's story), discussion of creativity, and role-playing have been used as techniques for fostering creative thinking. These techniques, when used with college students majoring in elementary education, resulted in an increase in the ability to think creatively as measured by the Baron-Welsh Art Scale (Brown, 1964).

Second-grade children who participated in unstructured play activities and teacher-pupil interaction that gave free rein to imaginative abilities achieved greater gains on the Product Improvement portion of the Test of Imagination than did children playing in a structured environment and participating in classroom interaction emphasizing convergent answers (Crabtree, 1962).

An analysis of classroom verbal interaction in classes of intellectually gifted youngsters indicated that the percentage of divergent questions asked by teachers was significantly lower than the percentage of divergent responses by children. However, as the number of teachers' divergent questions increased, the number of divergent responses by children increased proportionately (Gallagher and Aschner, 1963).

Implications for Teacher Education

Characteristics of creative teachers have been described as the result of several studies. These teachers have been found to possess a solid foundation of knowledge coupled with a freedom from conventional thinking; confidence in their own abilities, values, and judgments; faith in children; the ability to interpret for their pupils the work at hand and to present it to them in such ways as to stimulate curiosity and imagination; a willingness to give of themselves; and a lack of preoccupation with disciplinary matters (Forslund, 1961; Bond, 1959; Myers and Torrance, 1961).

Pre-service education has been found to have a positive influence on the adoption of recommended teaching practices (Smith, 1963; Lindsey, 1961; Zirbes, 1959). Student teaching experiences of nine-weeks duration during which pre-service teachers were supervised by experienced teachers and college personnel provided excellent opportunities for gaining creative insights as measured by the Test of Imagination (Goralski, 1964).

Devine (1964) found that improved creative-thinking ability by school principals participating in a workshop focused on conditions that were assumed to foster creative activity resulted in improved supervisory practices by the administrators and in more creative teaching by other instructional personnel.

Creative teaching has been demonstrated to result in improved creative-thinking ability of children. Classes taught by teachers

rated high on the Minnesota Tests of Creative Thinking and the Guilford tests achieved greater gains on the battery of creativity tests than did classes taught by teachers rated as low in this ability (James, 1963; Willard, 1955; Ort, 1955). Students taught by creative teachers demonstrated greater gains on standardized achievement tests than did students taught by less creative teachers (Hutchinson, 1963; Yamamoto, 1963).

Implications for this Study

The above review of literature forms the basis for the following assumptions which were employed in this study:

1. Healthy human beings have a potential for creative thinking. This potential varies among individuals in both degree and kind. The all-round creative individual is the exception rather than the rule.
2. The individuals with a great opportunity to foster creative thinking in children are their teachers. Teachers who possess the ability to think creatively foster creative thinking in their students.
3. Pre- and in-service teacher education can be designed to foster creative thinking in teachers.

Definition of Terms Used in this Study

Brainstorming: rapid listing of ideas without evaluation.

Creative thinking: intellectual activity which is divergent in nature in that it is directed toward a solution which has not been judged as "right" or "good" and can be measured by tests of creative thinking.

Creativity: the imaginative recombination of known elements into something new.

Evaluation: judgment-reaching decisions as to the goodness, correctness, suitability, or adequacy of what we know, remember, and produce in creative thinking.

Ideational fluency: ability to rapidly list meaningful words in a specified category or the listing of ideas to meet meaningful requirements.

Originality: the ability to produce novel ideas.

Sensitivity to problems: the ability to identify ways in which products or institutions can be improved or to identify flaws in proposed plans.

Spontaneous flexibility: the ability to shift from one classification of ideas to another.

Instruments Used in this Study

Alternate Uses

This test (Wilson, Christensen, Merrifield, and Guilford, 1960) is designed to assess the intellectual factor, "spontaneous flexibility." It is divided into three parts, with three items per part.

In each part of the test, examinees are provided the name of a familiar object such as a "safety pin." The usual use for the object is stated, and examinees are asked to list as many as six alternate uses for the object. The score is the number of acceptable non-duplicated responses, with no more than six responses credited for each item. Detailed instructions for scoring are provided in the manual.

Reliability estimates of the test, when administered to young adults, ranged from .68 to .81. In four samples of ninth-grade students, the estimates have ranged from .62 to .85. In adult samples the validity measures have ranged from .51 to .52.

Norms are available from three sources: a sample of 403 sixth-grade children, a sample of 808 ninth-grade students, and a sample of 696 college freshmen of above-average academic aptitude at the University of Texas.

Consequences

This test was designed by Christensen, Merrifield, and Guilford (1960) for grades nine through sixteen and adult populations. It is designed to assess the intellectual factors of "originality" and "ideational fluency." Ten items are included in the test; each requires the subject to list the results which might occur if some unusual situation came to pass. Relevant, non-duplicated responses are classified as "obvious" or "remote"; the frequency of the former yields a score of ideational fluency and the latter, a score of originality. A detailed set of guidelines for scoring the test is provided.

Reliability estimates range on the obvious scores from .87 for ninth-graders to .86 for young adults; for remote scores, .67 for ninth-graders and .82 for adults. Validity measures derived from administrations to young adults are .42 on the remote scores and .62 on the obvious scores.

Norms are available on four different populations: ninth-grade students, high school graduates with above-average IQ scores, engineering students, and marine officers.

Seeing Deficiencies

This unpublished test (Guilford, 1962b) is designed to measure the factor known as "sensitivity to problems." It is part of the battery of tests used by Guilford in his research at the University of Southern California. The test consists of twenty items; each is a proposed plan which contains one major flaw, rendering it impractical. The examinee is requested to read the plan and to specify in writing the major deficiency. The scoring manual provides the acceptable answers.

Reliability reports on the test following administration to aviation cadets ranged from .49 to .58. Reported validity is .58. Norms are unavailable for any population. All of the instruments designed to measure the "sensitivity to problems" factor are experimental and unpublished. Reports indicate relatively low reliability measures for all three tests. It was felt that an attempt should be made to assess this factor because of its reported high correlation with "fluency" and "originality." This particular test was

selected because the ability measured was similar to that required of participants in both the experimental and control groups dealing with problem situations.

CHAPTER III

DESIGN OF THE STUDY

Hypotheses

The literature reviewed in Chapter II provided the basis for the following hypotheses:

Hypothesis 1

Students participating in activities designed to foster creative thinking will demonstrate growth in this ability greater than non-participating students on measures of creative thinking designed by Guilford and associates.

Hypothesis 2

Students participating in activities designed to foster creative thinking will obtain higher scores on a test designed to measure originality of thinking in the field of curriculum than will non-participating students.

The Sample

The Ss of this study were thirty-six graduate students enrolled in a course in general curriculum in the College of Education, University of Florida, Gainesville, Florida, during the summer term of 1966. Each S was under contract as a member of the instructional staff in a public school system in Florida during the fall semester of 1966. This sample was selected for the following reasons:

(1) they possessed the same general occupational interest; (2) admission policies of the university tended to guarantee intelligence levels and achievement levels for subjects which were above average and afforded some extent of control of the variable of intelligence; and, (3) these subjects were located within a small enough geographic area (the state) to render them readily available for follow-up test administrations. They were selected from an enrollment in the class of 72 students.

Gathering the Data

The three creativity instruments were administered to the total enrollment of the class during the first week of the term. The instructor explained that these tests would in no way affect the grades in the course. Following the initial testing session the responses were scored and a battery total was derived for each of the 72 students. From the total group the teachers who were employed to teach in Florida public schools during the 1966-67 school year were randomly assigned to two groups. A total of 40 students was selected for these groups. One group served as the experimental group; the other, as the control group. Care was taken to equate the groups as nearly as possible on the basis of sex, teaching level (elementary, junior high, and senior high school), mean years of teaching experience, and mean total creativity scores. During the early portion of the course two subjects in the experimental group dropped the course from their schedules. In the latter phase of the

study two persons in the control group were inaccessible for testing. The sample was thus decreased from 40 to 36 subjects. Although the loss of these four subjects affected the equating of the groups, neither group over-balanced the other on any single factor. Table 1 describes the sample.

TABLE 1

DESCRIPTION OF THE SAMPLE BY GROUP

Group	Sex		Teaching Level			Mean Yrs. Teaching Exp.*	Mean Total Creativity Score**
	M	F	Elem.	J.H.	High		
Experimental	10	8	5	6	7	5.39	79.8
Control	11	7	8	3	7	6.30	78.4

* Years of experience within the two groups ranged from 0 - 36
** Means for the original two groups of 40 subjects differed by only .5

The remaining thirty-two students in the course were randomly assigned to two additional groups -- one of which duplicated the procedures of the experimental group; the other, the control group. This was an attempt to avoid the Hawthorne effect which was likely to occur if either the experimental or the control group deviated drastically in procedure from both of the other groups.

The four groups met semi-weekly for the discussion of hypothetical problem situations which were extensions of topics under

consideration in the regular class sessions. These were prepared under the supervision of the instructor. The problem situations were given to each student in written form prior to the group sessions. Groups met in separate classrooms each Tuesday and Thursday with a graduate assistant, each of whom was an advanced graduate student in curriculum and instruction. Three of these individuals were doctoral candidates. Leaders met with the same groups during the entire term. Sessions lasted one hour and were held twice a week for five and one half weeks.

The experimental group used the brainstorming technique in each of its sessions. The leader served as a facilitator for the flow of ideas, spurring the group with an alternate suggestion when ideation began to lag. Each session from the second until the final one was opened with an evaluation of the ideas presented during the previous meeting as well as suggested additions to the lists. Evaluation during the ideation period was strictly prohibited.

The leader of the control group was instructed to maintain himself as the center of the group and to direct the discussion. The group generally proceeded in a round table-discussion manner. Immediate evaluation by participants of their own ideas and feelings as well as those expressed by other members of the group was not only permitted, but this was encouraged by the leader.

A daily log was prepared by the leader of the experimental group. Sessions of both the experimental and control groups were

tape recorded. Partial transcripts are included in Appendices C and D for the purpose of contrasting the procedures.

During the final week of the course the creativity tests were again administered to the total enrollment of the class. Students were once more assured that the tests would have no effect on their grades for the course.

As a portion of the final examination for the course, students were asked to list changes in curriculum they would make on their own teaching level if they were given the freedom to do so. They were asked to justify their suggestions, thus convergent responses were requested. This was done for the purpose of attempting to satisfy an anticipated need felt by many students for expressing some of the things they had learned during the course. The second portion of this examination was designed to allow students to be divergent in their suggestions for change. They were asked to ignore any possible financial barrier in suggesting novel changes for their own teaching level -- changes they felt reasonably certain were not in practice in any school at present. No justification for these suggestions was required. This portion of the examination was rated by three independent judges. The identical final examination was administered during the spring term to students enrolled in this course. The tests were utilized in training the judges for this study. An inter-rater reliability coefficient (coefficient of concordance) of .97 was computed. Correlations were computed

between the originality portion of the final examination and the scores of originality derived from the second administration of the Consequences test.

Beginning the second week in October, 1966, the 36 subjects in the experimental and control groups were administered the three creativity tests in their home locales. Permission of the subjects to visit them and administer the tests was secured before the completion of the course. This portion of the study was designed to measure retention of the increase in creative thinking.

Only the responses from the first administration of the creativity tests were scored prior to the completion of the follow-up study; the scoring of the initial tests was necessary to derive the four groups and to equate the experimental and control groups on the factor of total creativity scores. The first and second administrations of the tests were given by an independent examiner. The third administration, because of the time and expense involved, was performed by this writer. All scoring of the creativity tests was accomplished by the same individual.

Analysis of Data

Data for each subject included the following:

Group

Sex

Years of teaching experience

Present teaching level

Scores on Alternate Uses test

Gain on this test between administrations

Scores on the Consequences test

Gain on this test between administrations

Scores on the Seeing Deficiencies test

Gain on this test between administrations

Score on the originality portion of the final examination

In addition, mean scores, standard deviations, and t-ratios were derived for each administration of each of the tests. The originality and ideational fluency factors of the Consequences test were treated as separate scores. The original data appear in Appendix A.

Hypothesis 1 was tested by use of t-ratios to determine the significance of differences between the two groups in mean gains between the first and second administrations of the creativity tests as well as between the second and third and the first and third.

Hypothesis 2 was tested by use of a t-ratio to determine the significance of differences between the two groups on scores from the originality portion of the final examination for the course as rated by the judges. A Pearson Product Moment Correlation was computed using the originality scores derived from the second administration of the Consequences test and those derived from the final examination. Correlations were computed for the total sample and for each of the two groups.

Limitations

Generalization of the results of this study to other populations of teachers is limited by several factors.

The Sample

A major limitation of this study is the size of the sample. The original sample of forty Ss was itself too small to make valid any generalization for large populations; the final sample of 36 included in the study, compounds this limiting factor. The ideal size of a brainstorming group, however, is approximately ten persons. The size of the experimental group was almost twice the suggested size. Increasing the size of this group to 25 or 30 persons would have tended to inhibit the flow of ideas and defeat the purpose of the technique. The provision of two experimental groups would have necessitated the assignment of an additional leader and would have lessened the control of the variable of the group leader.

The nature of the sample is a further limitation. Teachers who attend a 7 1/2 week summer session at a university are, unfortunately, neither illustrative of graduate students as a population or of teachers participating in an in-service program during the school year in their home locales. Rarely are these students enrolled in only one course as they are likely to be in an in-service program. The pressures of other courses during such a short period are uncontrollable variables. The sample cannot be compared to students in a pre-service teacher education program.

Instruments

The non-existence of alternate batteries of the instruments is a further limitation of this study. The same tests were used in each administration. The Seeing Deficiencies test has only one acceptable response for each proposed plan and has a ceiling of only twenty possible points. This test provides a great contrast with the Consequences test and the Alternate Uses instrument, which accept any non-duplicated response. Gains are much more likely to occur on these tests than on that with a ceiling of twenty.

It is possible that the previous exposure to the instruments may account for a portion of the gains made between administrations. However, both groups experienced the same period of exposure and it is unlikely that this factor affected significantly the differences between the groups.

Time

The 7 1/2-week period involved in the study was a brief one. The period of time between the first and second administrations was seven weeks. The follow-up administration covered a period of from ten to thirteen weeks after the second administration. This range of time was caused by the fact that this writer traveled throughout the state collecting data from the final administration.

The twenty-three weeks involved in the total study was too brief a period to adequately measure any lasting change in creative-thinking ability. A period of at least one year would have provided a more optimum period during which to measure the retention or loss of this ability.

Anxiety

The second administration of the battery of creativity tests and the administration of the essay examination requiring divergent responses were accomplished during the week of final examinations. The anxiety of students during this period was apparent to the instructor as well as to the group leaders. The course is a prerequisite for all other curriculum courses at the University of Florida. This fact may have served to increase the level of anxiety.

If the course had not required a final examination, the anxiety factor might have been diminished if not eliminated. Results of the second administration of the battery of creativity tests might have indicated an even greater increase in creative-thinking ability. The scheduling of the battery of creativity tests during this period was deliberate. It was believed that any increase in creative-thinking ability demonstrated under these conditions would indeed be indicative that this growth was sufficient enough to withstand anxiety.

The Third Administration of the Tests

The initial and second administrations of the tests were given by the same individual, whose sole involvement with the subjects was during the test administrations. The third administration of the tests, because of the amount of time and expense involved in traveling to the home areas of each of the subjects, was accomplished by this writer. The first and second administrations were

given in the regular meeting place of the class and under as nearly optimum conditions as could be provided. The third administration was given in a variety of places and under a wide range of conditions. Testing, in each instance, was done on the subjects' own time. Environment included a classroom after school, the living room of a subject's home, a staff conference room, a subject's private office, a motel room, and a teachers' lounge. Whenever possible, all subjects who lived in a geographical area were tested as a group. In many instances, however, subjects were tested on an individual basis.

In short, it is reasonable to assume that the lack of control over the test environment for the third administration of the tests may have affected the data derived from the results of the tests.

CHAPTER IV

RESULTS AND ANALYSIS OF DATA

Results Related to Hypotheses

Hypothesis 1

Students participating in activities designed to foster creative thinking will demonstrate growth in this ability greater than non-participating students on measures of creative thinking designed by Guilford.

Data pertinent to findings related to this hypothesis are to be found in Tables 2 and 3. Table 2 provides data pertaining to the mean scores and standard deviations of each group on each measure of creative thinking for each of the three administrations. The control group obtained greater mean scores than did the experimental group on the initial administration of the tests measuring "originality" and "seeing deficiencies." The opposite is true on the factors of "spontaneous flexibility" and "ideational fluency." On the second administration of the tests, the experimental group obtained greater mean scores than the control group on all four factors — although only slightly greater on the measure "seeing deficiencies." The mean gain for this factor was 0.889 points greater than that experienced by the control subjects.

TABLE 2

MEANS AND STANDARD DEVIATIONS
BY GROUP

Test	Administration 1				Administration 2				Administration 3			
	Experimental		Control		Experimental		Control		Experimental		Control	
	Mean	S.D.	Mean	S.D.	Mean	S.D.	Mean	S.D.	Mean	S.D.	Mean	S.D.
Spontaneous Flexibility	20.44	8.41	19.16	8.68	37.00	8.52	30.55	8.41	40.72	12.00	35.83	9.62
Originality	10.61	5.74	12.94	7.19	16.77	7.06	9.88	7.23	29.22	11.81	15.27	9.70
Ideational Fluency	40.83	10.79	37.55	10.55	63.16	16.21	55.27	20.00	58.16	18.85	52.72	16.74
Seeing Deficiencies	7.94	3.81	8.77	3.00	10.05	3.53	10.00	3.80	13.00	3.39	11.22	2.94

TABLE 3

MEAN DIFFERENCES, STANDARD DEVIATIONS, AND t-RATIOS ON FOUR FACTORS OF CREATIVITY FOR EXPERIMENTAL GROUP (N = 18) AND CONTROL GROUP (N = 18)

Creativity Factors	Between 1st & 2nd Administrations			Between 2nd & 3rd Administrations			Between 1st & 3rd Administrations		
	Exp. Grp.	Con. Grp.	t ratio	Exp. Grp.	Con. Grp.	t ratio	Exp. Grp.	Con. Grp.	t ratio
Spontaneous Flexibility									
$\bar{X}$ diff.	16.33	9.56	2.93**	6.50	6.28	0.11	23.00	14.83	3.09**
S.D.	7.06	6.85		7.02	3.79		7.75	8.10	
Originality									
$\bar{X}$ diff.	5.61	-2.83	4.45***	12.44	5.39	2.77**	18.61	2.33	5.65***
S. D.	5.46	5.91		8.87	6.13		9.50	7.71	
Ideational Fluency									
$\bar{X}$ diff.	22.33	17.72	0.98	-5.22	-2.55	0.58	17.44	15.17	0.41
S.D.	13.18	14.91		15.84	10.87		18.88	14.19	
Seeing Deficiencies									
$\bar{X}$ diff.	2.11	1.22	1.26	2.94	1.22	2.20*	4.94	2.44	2.84**
S.D.	2.03	2.18		2.04	2.60		2.46	2.81	

* Significant at the 0.05 level; 35 d.f.
** Significant at the 0.01 level; 35 d.f.
*** Significant at the 0.001 level; 35 d.f.

Table 3 provides data concerning mean differences between the groups, standard deviations, and t-ratios for all four creativity factors between administrations of the tests. Acceptance of levels of significance was limited to 0.05, 0.01, and 0.001. The test designed to measure the factor "spontaneous flexibility" (SF) discriminated between the growth experienced by the two groups between the first and second administrations of the test, reaching the 0.01 level of significance. The "originality" factor (O), as measured by the Consequences test, indicated a difference in gain between the two groups at the 0.001 level of significance. The two additional factors, "ideational fluency" (IF) and "seeing deficiencies" (SD), indicated no significant difference between the gains of the two groups. It should be noted, however, that the scoring manual for the Consequences test, which assesses both "originality" and "ideational fluency," requires the scorer to judge a response as either "obvious" or "remote," thereby eliminating responses rated as "remote" from the score of "ideational fluency." The test designed to measure the ability to see deficiencies (SD) has a scoring ceiling of twenty points. The hypothesis can be accepted only on measures of spontaneous flexibility and originality.

Hypothesis 2

Students participating in activities designed to foster creative thinking will obtain higher scores on a test designed to measure originality of thinking in the field of curriculum than will non-participating students.

Mean scores for the two groups were derived from the "originality" portion of the final examination for the course. The mean score for the experimental group was higher than that of the control group, but the difference between the groups did not reach the 0.05 level of signiiicance (see Table 4).

Scores from the second administration of the Consequences test, which measures "originality" and the responses obtained from the latter portion of the final examination were compared in an effort to determine the correlation between the scores. The mean score for the experimental group was greater on both measures than was that of the control group -- almost twice that of the control group on responses rated by the independent judges.

Pearson Product Moment correlations were computed between the test scores and the responses on the final examination. Each group was treated separately and as part of the total sample. Correlations were as follows: experimental group, .43; control group, .53; total sample, .42.

The two instruments contrasted to a great extent in content, scoring procedures, and the circumstances under which they were administered. The published test included hypothetical situations that applied to several areas of life; the final examination, to a much more narrow category in a specialized field, curriculum. The published test granted greater freedom in scoring procedures for originality than did the final examination. Marginal responses on the Consequences test were scored as original. The judges were instructed

TABLE 4

ORIGINALITY TEST AND JUDGES' RATINGS

Experimental Group			Control Group		
Subject	Originality Test Score	Judges' Rating	Subject	Originality Test Score	Judges' Rating
1	26	3	3	13	3
2	14	8	6	4	3
4	15	1	8	3	4
5	25	17	9	11	4
7	11	6	10	14	6
11	20	9	14	25	6
12	19	6	16	4	1
13	6	1	17	5	2
15	23	5	20	2	0
18	5	8	21	2	2
19	14	11	24	8	0
22	24	17	25	22	6
23	24	3	26	12	3
27	25	12	28	16	3
30	12	3	29	2	3
31	16	3	32	7	7
33	5	0	34	8	1
35	18	0	36	20	3
Mean	16.77	6.28		9.88	3.17
S.D.	7.06	5.30		7.23	4.26

Combined Mean - Originality test, 13.33
Judges' Rating, 4.72

Standard Deviation - Originality test, 7.87
Judges' Rating, 4.27

t-ratio - Judges' Rating, 1.93; $p > 0.05$

to rate as original only those responses which they had never seen in print and were fairly certain were not in existence in any school system. (Appendix E provides a partial list of responses rated as original by the judges.)

The Consequences test was administered as part of the creativity battery near the close of the term and during the regularly scheduled class period. The originality portion of the final examination was administered during the scheduled examination period and followed a section requiring convergent answers and justification for these responses.

Additional Findings

The literature is sparce concerning the retention of growth in creative thinking. Table 2 indicates that the experimental group demonstrated gains on all factors except "ideational fluency" between the second and third administrations. There was a mean loss on this factor of 5.22 points. The control group's mean loss on the same factor was 2.55 points. The mean gain for the experimental group was higher than that of the control group on the third, or "follow-up," administration of each of the other three factors. Table 3 indicates that a difference beteen the groups, significant at the 0.01 level, was found between the second and third administrations of the test designed to measure "originality." The third administration of the test designed to measure the ability to see deficiencies (SD) indicates a difference between the gains of the two groups at the 0.05

level of significance. Although the experimental group demonstrated a gain on the creativity factor "spontaneous flexibility" greater than that of the control group, the difference between the groups was not significant. The mean loss by the experimental group on "ideational fluency" was greater than that experienced by the control group. It should be noted, however, that as the incidence of responses scored as "original" on the Consequences test increases, a decrease in the number of responses scored as "obvious" (therefore, indications of "ideational fluency") is to be expected.

An examination of differences between the gains of the two groups from the first to the final administration of the tests of creative thinking indicates significance at the 0.01 level on measures of "spontaneous flexibility" and "seeing deficiencies". A significance at the 0.001 level was found between the groups on the factor of "originality." No significant difference was found between the groups on the factor of "ideational fluency."

CHAPTER V

SUMMARY, RESULTS, IMPLICATIONS, LIMITATIONS, AND SUGGESTIONS FOR FURTHER RESEARCH

Summary

This study was designed to investigate the possibility of increasing the creative-thinking ability of teachers (as measured by the Guilford tests of the factors of spontaneous flexibility, ideational fluency, originality, and seeing deficiencies) by the use of brainstorming and deferred-judgment techniques. It was suggested that the use of brainstorming as a portion of a general course in curriculum would increase the ability of teachers to demonstrate creative thinking as measured by these test instruments. It was expected that subjects participating in brainstorming activities would demonstrate growth in this ability significantly greater than growth achieved by non-participating students. It was further expected that students who had participated in brainstorming and deferred-judgment activities would obtain higher scores on a test designed to measure originality of thinking in the field of curriculum than non-participating students.

The Ss studied were selected from the enrollment in a graduate course in general curriculum (ED 600) during the summer term at

the College of Education, University of Florida. Thirty-six persons were included; all were under contract as members of the instructional staff in some Florida public school system for the 1966-67 school year. The total sample was divided into two groups; half was assigned to the experimental group, half to the control group. The groups were equated on several variables: mean total score on the battery of creativity tests, mean years of teaching experience, representation of each sex and teaching level. Two other groups were formed from the remaining enrollment in the class. One of these groups utilized the same techniques employed by the experimental group. The other utilized a technique similar to that of the control group. Each of the four groups was led by an advanced graduate student in the field of curriculum and instruction.

The groups met semi-weekly for a period of six weeks. Discussions were centered around hypothetical problem-situations arising from topics under consideration in the regular class sessions. The experimental group used brainstorming activities in listing ideas pertaining to possible solutions. The control group used a round-table discussion approach to arriving at solutions.

At the end of the term the battery of creativity tests was again administered to the total enrollment of the course. The gains made on each instrument by the experimental and control groups were compared to determine if significant differences existed. During the final examination period, as part of an essay examination, all students were asked to suggest changes in the school program which

were, to their knowledge, non-existent in any school. The degree of originality of these responses was determined by three independent judges who had been trained during a pilot study. The pilot study involved the rating of responses on the same type of examination administered to another group enrolled in the course during the spring term. Mean scores of the two groups were compared to determine if there was a significant difference between the groups on this test. The subjects' scores derived from the judges' ratings were compared to their scores on the Guilford test designed to assess originality, which was administered at the end of the term. A correlation was computed for each group and for the total sample.

During a period of from ten to thirteen weeks after the close of the summer term the Ss in the experimental and control groups were again administered the battery of creativity tests in their home areas. The scores of the two groups were compared to determine if creative-thinking ability, once it has been increased by a deliberate attempt to do so, maintained its improved state, increased further, or declined when subjects returned to their teaching situations. If there was a gain, the significance of differences between the two groups was to be determined.

Results

The statistical analysis of data partially supported the hypothesis that the brainstorming technique would cause a significant difference between participating and non-participating groups

on measures of creative thinking. A difference in gains significant at the 0.01 level was indicated on the second administration of the test of spontaneous flexibility. The difference was in favor of the experimental group. A more significant difference (at the 0.001 level) was found in favor of the experimental group on the second administration of the test designed to measure the factor of originality. The experimental group acquired greater gains than did the control group on measures of ideational fluency and the ability to see deficiencies. These gains, however, did not reach the 0.05 level of significance.

A third, or "follow-up," administration of the tests indicated that both groups increased in creative-thinking ability between the second and third administrations as measured by the tests of spontaneous flexibility, originality, and the ability to see deficiencies. The significance of the differences between the gains of the two groups was evident only on the "originality" and "seeing deficiencies" factors. The results were in favor of the experimental group and reached the 0.01 level of significance for "originality" and the 0.05 level of significance for "seeing deficiencies." The results of the second administration of the instrument designed to assess ideational fluency indicate a decrease in this ability for both groups. The differences between the groups did not reach the 0.05 level of significance. The loss on this factor was greater for the experimental group than for the control group.

A positive correlation was found between the judges' ratings of the final examination and the scores on the test of originality for both groups and for the total sample. The highest coefficient of correlation was found for the control group. The scores on the final examination did not differentiate between the groups at the 0.05 level of significance.

Implications

The results of this study support the belief that deliberate attempts to foster creative thinking by utilization of the brainstorming technique can result in an increase in this ability. The increase can occur when the technique is employed as a portion of a regular course taught at the graduate level in a university. It seems reasonable to assume that this technique could be equally successful when used in other courses. A determining factor of success may be the use of discussion situations which are closely related to topics under discussion in regular class sessions and which, therefore, do not divert the attention of the participants from the content of the course. A diversion of attention would possibly cause anxiety in students and inhibit the flow of ideas. A separate course in creative problem-solving, such as is offered in some institutions, might not encounter this difficulty; although it would encounter others, especially a lack of content.

Instructors who possess an understanding of the technique and skill in its implementation may find that it is useful in stimulating

the creative thinking of their students, regardless of the nature of the course. It is the experience of this writer that a degree of rapport is achieved between the students and the discussion leader which might not have been reached if a technique designed to encourage convergent thinking had been used. The freedom from the threat of evaluative judgment and an openness of the flow of ideas seem to be the crux.

Suggestions for Further Research

This study should be replicated with samples in other phases of teacher education. Courses involving more specific and more limited content -- such as a methods course in the teaching of science in the secondary school -- would provide sample populations with more similar curriculum interests and backgrounds of academic preparation than were to be found in the sample involved in this study.

Research should be conducted to assess the effectiveness of the brainstorming technique when it is employed in conjunction with in-service teacher education in a local school system. This type of research should be conducted in courses of many kinds, including a separate course in creative problem-solving. A study of the effect of participation in brainstorming activity on the teacher's classroom behavior is also needed. An in-service course which employs this technique and whose enrollment includes not only classroom teachers but their administrators and supervisors would provide the basis for a valuable study to assess not only the effect of the course on classroom

behavior of teachers but the interrelationship of the administrators' and supervisors' improved creative-thinking ability and the teachers' classroom behavior.

Research which studies the effect of the teacher's use of the brainstorming technique in his classroom on the creative-thinking ability of his pupils is sorely needed. Teacher-pupil interaction, the types of questions and activities employed which call for divergent thinking, and pupil performance on tests of creative thinking should be included in such studies.

Longitudinal studies should be conducted involving samples of pre-service teachers in an attempt to assess the effect of experience in brainstorming as part of undergraduate courses in a university, student teaching experience, and supervision during the first year of teaching on the teacher's classroom behavior and the creative-thinking ability of the students in his classroom.

Finally, much more research is needed on the tests designed to measure creative thinking. Alternate batteries of these tests should be devised, standardized, and validated in order to reduce the limitations imposed on studies by the use of identical tests in pre- and post-test administrations. As new dimensions of creative thinking are identified, work should be immediately underway to devise means of measuring these dimensions.

APPENDICES

APPENDIX A

TABLE OF ORIGINAL DATA

S	Group	Sex	Yrs. Teach. Exp.	Teach. Level	Creativity Tests*												Final Exam
					Admin. 1				Admin. 2				Admin. 3				
					SF*	O	IF	SD	SF	O	IF	SD	SF	O	IF	SD	
1	Exp.	M	0	High	25	11	30	03	48	26	30	10	51	35	36	13	3
2	Exp.	F	5	Jr. H.	17	0	23	14	36	14	58	10	43	21	81	14	8
3	Con.	M	7	High	20	04	30	12	33	13	52	12	31	21	43	14	3
4	Exp.	M	2	Jr. H.	20	04	38	09	34	15	62	10	34	19	54	15	1
5	Exp.	M	0	Elem.	23	17	46	10	36	25	49	14	42	40	38	16	17
6	Con.	M	8	Elem.	22	17	54	07	29	04	90	11	40	18	78	11	3
7	Exp.	F	16	Elem.	21	08	34	06	29	11	62	07	43	25	48	12	6
8	Con.	F	36	Elem.	16	14	38	08	27	03	77	09	36	07	94	11	4
9	Con.	F	1	Elem.	14	12	38	09	31	11	39	09	29	17	35	10	4

* SF = Spontaneous Flexibility
O = Originality
IF = Ideational Fluency
SD = Seeing Deficiencies

TABLE OF ORIGINAL DATA—Continued

S	Group	Sex	Yrs. Teach. Exp.	Teach. Level	Creativity Tests*												Final Exam
					Admin. 1				Admin. 2				Admin. 3				
					SF*	O	IF	SD	SF	O	IF	SD	SF	O	IF	SD	
10	Con.	M	18	High	22	17	48	16	38	14	63	17	45	14	56	13	6
11	Exp.	F	2	Jr. H.	07	15	60	03	19	20	97	07	43	56	77	10	9
12	Exp.	F	2	Elem.	26	17	46	08	46	19	69	10	44	29	55	11	6
13	Exp.	M	15	High	11	09	49	03	34	06	73	03	42	19	76	10	1
14	Con.	M	1	High	23	34	24	11	40	25	49	11	47	38	43	13	6
15	Exp.	M	1	Jr. H.	39	13	39	12	42	23	61	15	48	47	42	18	5
16	Con.	F	4	Elem.	11	12	27	09	30	04	42	09	37	07	46	10	1
17	Con.	M	5	High	20	13	26	07	13	05	25	05	21	08	26	06	2
18	Exp.	M	2	High	13	10	34	03	24	05	79	05	41	18	77	04	8

* SF = Spontaneous Flexibility
O = Originality
IF = Ideational Fluency
SD = Seeing Deficiencies

TABLE OF ORIGINAL DATA—Continued

S	Group	Sex	Yrs. Teach. Exp.	Teach. Level	Creativity Tests*												Final Exam
					Admin. 1				Admin. 2				Admin. 3				
					SF*	O	IF	SD	SF	O	IF	SD	SF	O	IF	SD	
19	Exp.	M	1	High	28	10	41	11	37	14	44	10	46	33	44	15	11
20	Con.	M	3	High	13	06	28	04	18	02	42	04	13	01	51	05	0
21	Con.	F	3	Elem.	20	11	30	09	19	02	31	06	21	06	34	09	2
22	Exp.	F	15	Elem.	10	23	47	09	39	24	68	11	50	36	94	13	17
23	Exp.	F	3	Jr. H.	25	18	62	16	48	24	85	16	53	36	51	18	3
24	Con.	M	6	Jr. H.	30	09	46	07	35	08	81	11	37	13	57	11	0
25	Con.	M	3	Elem.	29	16	52	10	38	22	69	10	46	24	69	12	6
26	Con.	M	1	High	28	16	34	09	38	12	83	13	38	12	68	14	3
27	Exp.	M	5	High	34	09	50	08	48	25	50	13	52	39	44	15	12

* SF = Spontaneous Flexibility
O = Originality
IF = Ideational Fluency
SD = Seeing Deficiencies

TABLE OF ORIGINAL DATA—Continued

S	Group	Sex	Yrs. Teach. Exp.	Teach. Level	Creativity Tests*												Final Exam
					Admin. 1				Admin. 2				Admin. 3				
					SF*	O	IF	SD	SF	O	IF	SD	SF	O	IF	SD	
28	Con.	F	1	Elem.	21	13	28	10	35	16	28	12	43	14	40	13	3
29	Con.	M	14	Jr. H.	17	02	31	02	22	02	52	02	35	05	46	11	3
30	Exp.	M	5	High	23	05	27	14	48	12	49	14	49	12	53	16	3
31	Exp.	F	3	High	16	10	45	04	32	16	78	09	39	17	90	10	3
32	Con.	F	1	High	23	09	46	10	36	07	66	14	43	30	61	16	7
33	Exp.	F	15	Elem.	17	05	29	06	31	05	53	06	34	25	44	12	0
34	Con.	M	2	Jr. H.	20	07	39	08	25	08	39	11	37	13	51	08	1
35	Exp.	M	5	Jr. H.	13	07	35	09	35	18	70	11	29	19	43	12	0
36	Con.	F	3	Elem.	29	21	57	10	43	20	67	14	46	27	51	15	3

* SF = Spontaneous Flexibility
O = Originality
IF = Ideational Fluency
SD = Seeing Deficiencies

APPENDIX B

FINAL EXAMINATION

Name _____

Group Number _____

You are the curriculum director for a school system, principal of a school, or department chairman of a school. Identify which of these roles you are assuming and the level at which you are working (elementary; junior high; senior high; community college). Answer the following questions in the space provided.

Role_____ Level_____

A. You have been granted unlimited funds with which you may make any changes you choose in the curriculum, which you believe would improve it in the light of current ideas in the literature. List the changes you would make, and briefly tell why you would make them.

1. _____

_____

_____

2. _____

_____

_____

3. _____

_____

_____

4. _____

_____

_____

5. _____

_____

_____

(GO ON TO THE NEXT PAGE)

6. _____

7. _____

8. _____

9. _____

10. _____

11. _____

12. _____

13. _____

(GO ON TO NEXT PAGE)

14. _____

_____

_____

15. _____

_____

_____

B. As the person in this role and with unlimited funds, list changes you would make which, to your knowledge, have never been thought of before. This may include any area of the curriculum — instructional materials, grouping for instruction, content, etc. LET YOUR IMAGINATION RUN WILD! THIS IS YOUR CHANCE TO DREAM! Describe each change briefly.

1. _____

_____

_____

2. _____

_____

_____

3. _____

_____

_____

4. _____

_____

_____

(GO ON TO THE NEXT PAGE)

5. _____

6. _____

7. _____

8. _____

9. _____

10. _____

11. _____

12. _____

(GO ON TO THE NEXT PAGE)

13. _____

_____

_____

14. _____

_____

_____

15. _____

_____

_____

16. _____

_____

_____

(IF ADDITIONAL SPACE IS NEEDED, USE REVERSE SIDE)

APPENDIX C

PARTIAL TRANSCRIPT OF A

CONTROL GROUP SESSION

Leader: "As a teacher what do you see as some of the ways you could seek to relieve some of the pressures and anxiety which students encounter because of testing and grading? This first question is one that I think faces every teacher, or should, before he ever makes out a test. It is also the one that probably faces most of the teachers -- I hope -- before they ever decide they're going to give a test. In other words, the problems of testing and grading should be ones that we cope with when we decide to teach the course. There are many other things involved besides simply the reduction of anxiety and pressure -- something about the philosophy of the individual teacher is involved here."

Student A: "I think teachers can explain the grading system. Chances are individual tests are not going to count that much toward the grade. It shouldn't. Of course, now, I'm sure everyone here has experienced a class in which you go along for a semester and about half-way through you find out your grade is going to be determined by the final. Now, in this case I don't know what you can say except, 'Good luck' or maybe the teacher ought to limit the material and

tell the class what kind of test it will be. All these factors would help to relieve anxiety. In other words, when you find out simply if the test will be objective or essay, everybody feels somewhat relieved."

Leader: "Why is that?"

Student A: "Well, you have some idea as to what to study."

Student B: "I think beyond that. I give quizzes twice a week. For major tests I make up a practice test and give it to them and they enjoy this. Another place to take pressure off is during the six-week testing period when they may take 7 or 8 quizzes. Take the lowest score and throw it out. Also, because we do have a six-week testing period, some teachers think they have to give a test then. What I like to do, if I can arrange my schedule that way, is to give the 4th period class a study period on the day the 5th period class is scheduled to take their test."

Leader: "You're explaining or illustrating what I spoke of earlier — that band of what we can and can't do. In a six-week grading period there's a good deal of variation allowed. He doesn't give a test and he still maintains his job. Some of us are hooked by the system."

Student B: "I went twelve weeks last year without giving a test. I received some criticism, but actually the kids had tests all the time. I called them 'exercises.' This is a form

of brainwashing, I realize. The tests were not objective but essay. When they got them back they had much writing and comment on them. I found they were more interested if I let them work together on them, and I found it's a very real problem. If anxiety and pressure can be relieved, the kids will make a more honest attempt. Some of them may never have passed a test."

Leader: "Why are you giving tests in your classrooms?"

Student C: "So the children can see how much they have learned. This is why it should be given."

Leader: "For reports to self?"

Student C: "This is why I give a test. I always give a pre-test and tell the students that 'This will not go into my grade book. Nothing that you do on this will go in. It is to find out how much you've learned so far.'"

Student D: "How do they feel about this?"

Student C: "They don't feel bad about taking these tests. They know that they are going to have to put themselves up against what they've done."

Student E: "We're teaching through repetition. In fact, that's what the test is itself, and there's no learning out of it."

Student C: "They also, by this pre-test, know what to study.

Leader: "Why not give them a copy of the test before you ever begin the unit?"

Student C: "Well, I give them study sheets of what they're expected to do, which is another form, and the tests are made up from the study sheets."

Leader: "I know, but if you know what test you're going to give them at the end of the instructional period, why not give them form A of that test before they even start?"

Student D: "Some of them will learn just exactly what you have on that and nothing else — they won't care to learn anything else."

Leader: "My next question is — teachers who don't do this that I have suggested, that use the grade on the test at the end of a learning period, have now marked the student as having learned just that much or not just that much?"

Student A: "But you don't use just a written test in evaluating students."

Leader: "Good!"

Student C: "Most elementary people don't, but I'm not too sure about secondary people."

Leader: "My experience with secondary people may be different from yours, but I agree. Why do we give tests? One answer given is to report the student's progress to him for his own benefit."

Student C: "It's a way they can organize what they have learned."

Student E: "I think this is more valid for the upper elementary grades or for high school. They are not needed in the lower

grades because they have the advantage of a smaller group of children and can know them better and what they need."

Leader: "Do you have report cards that are broken down into many subject areas?"

Student E: "Yes, but we don't have to give grades. We just say 'has improved' or 'needs to improve.' This is a fallacy of this type of report card."

Student C: "I'm a firm believer that in many situations -- not in all -- that report to self and conferences should be used, but you'd better have a mark -- something concrete -- when you have them. I wouldn't even have a grade on the 'exercises' -- I would have given group exercises. My evaluation of a child."

Leader: "Shouldn't it be the other way around?"

Student F: "Teachers have been reprimanded for giving a grade without justification -- meaning there is no written test."

Leader: "Higher or lower than expected?"

Student F: "Lower."

Leader: "You don't get reprimanded if you give many A's and have no justification for A's?"

Student F: "Oh, no."

Student C: "I think there is a pressure when you give higher grades."

Student F: "I give 40 B's and receive no reprimand whatsoever. Then I give 40 E's and I am reprimanded. You're expected

to be able to show it in the grade book. I really don't need a grade book."

Leader: "I often wonder how parents decide whether a child is 'good' or 'not good' in a family. Maybe they keep a grade book, too."

Student F: "We have to give tests and an A or a C or an E and justification for the grade. Like you said, the pressure is great."

Leader: "It depends on how broad the range is. See if you can get away with not giving grades."

APPENDIX D

PARTIAL TRANSCRIPT OF AN EXPERIMENTAL

GROUP SESSION

Leader: "As a teacher what do you see as some of the ways in which you could seek to relieve some of the pressure and anxiety which students encounter because of testing and grading?"

Student A: "Refrain from being tense yourself."

Student B: "Eliminate testing and grading."

Student C: "Don't try to make tests as hard as possible -- be reasonable."

Student D: "Use 'pass' or 'fail' -- no other grades."

Student E: "Counsel students and parents that grades aren't that important."

Student F: "Call them 'quizzes', not tests."

Student F: "Be a buddy to the students."

Student G: "Play music before the tests."

Student H: "Have a party before tests."

Student I: "Allow students to chew gum during the test."

Student J: "Tell a few jokes before the test."

Student K: "Provide comfortable test facilities."

Student L: "Let students grade themselves."

Student M: "Give a pre-test."

Student N: "Orient them and condition them to testing."

Student O: "Use the 'contract' method -- sign for grades and do certain amounts of work."

Student E: "Encourage the honor system."

Student B: "Give an open-book exam."

Student G: "Don't use tests as the only basis for grading."

Student I: "Use discussion groups and grade on the ideas that come up."

Student A: "Give more tests."

Student M: "Make old tests available for study."

Student B: "Grade on individual improvement."

Leader: "Are there more?"

Student A: "Eliminate tests."

Student N: "Substitute some other criteria."

Student A: "Give a review period prior to the tests."

Student I: "Give pop tests."

Student E: "Give make-up tests."

Student K: "Allow students to design tests."

Student B: "Give out the questions before the test."

Student M: "Stress daily assignments so tests won't be feared."

Student C: "Allow projects instead of tests -- reports or making something with their hands."

Student O: "Give projects and allow students to drop their two lowest test grades."

Student G: "Correlate portions of the test with student experiences."

Student L: "Never grade below 'C' -- not below 'B' in graduate school."

Leader: "Others?"

Student E: "Provide a period of relaxation during the test."

APPENDIX E

SAMPLE RESPONSES ON FINAL EXAMINATION

RATED AS ORIGINAL

BY THE JUDGES

"Saturday classes (with additional pay for teachers) for a continuous enrichment program available to all children."

"Charter planes, buses, etc. to take students to geographic areas that they are studying."

"Revolving walls -- moon terrain or desert or other terrain may be simulated on one side of the room."

"In Florida pupils could have underwater classes. Tropical fish can be studied best alive."

"Charm and dramatic courses for teachers who will instruct large groups -- grooming, voice control, etc."

"Allow home economics classes to open a restaurant and small clothing store in the school."

"Build schools which are substantial -- yet movable -- so that they could be relocated in areas of extreme beauty and educational value if the need was felt."

"Provide a little zoo and aquarium where children could care for and observe domestic animals and the hardier wild types live and reproduce -- a homelike background so they could see the

effect of environment on animal life -- include an aviary with a high screened-in space."

"A Cinerama movie theater provided to give 'spice' to instructional films."

"A language community -- a part of a city block, perhaps, where the learner of foreign languages could go and experience the language."

"A drive-in section for each school for those students with cars. Many large group presentations would be on drive-in screens. For small group and individual work they may or may not leave the cars, depending on the situation."

"Released time (pre-school or school recess for a few days) for a whole system to visit famous model schools such as Nova and Melbourne."

"Provide a dormitory at school for disadvantaged children and children who are emotionally disturbed, so that they can get away from a bad home environment."

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BIOGRAPHICAL SKETCH

Mary Frances Compton is a native of Paris, Tennessee. She graduated from Western High School in Detroit, Michigan, in 1949 and received her Bachelor of Science degree from George Peabody College for Teachers, Nashville, Tennessee, in 1953.

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This dissertation was prepared under the direction of the chairman of the candidate's supervisory committee and has been approved by all members of that committee. It was submitted to the Dean of the College of Education and to the Graduate Council, and was approved as partial fulfillment of the requirements for the degree of Doctor of Education.

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